



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/003,363	11/15/2001	Yukiko Kubota	010952	4664
23464	7590	07/13/2004	EXAMINER	
BUCHANAN INGERSOLL, P.C. ONE OXFORD CENTRE, 301 GRANT STREET 20TH FLOOR PITTSBURGH, PA 15219			BERNATZ, KEVIN M	
			ART UNIT	PAPER NUMBER
			1773	

DATE MAILED: 07/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/003,363	Applicant(s) KUBOTA ET AL.	
	Examiner Kevin M Bernatz	Art Unit 1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10,12-21,25,32,34 and 36-47 is/are pending in the application.
 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-10,12-21,25,32,34 and 36-47 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date <u>07092004</u> . <u>26 Feb 04</u> |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Response to Amendment

1. Amendments to claims 1, 10, 12, 14, 34 and 36 - 44, and cancellation of claims 27, 29 – 31 and 35, filed on April 20, 2004, have been entered in the above-identified application.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Examiner's Comments

3. Regarding the limitation(s) "non-biased" in claims 1 and 34, the Examiner has given the term(s) the broadest reasonable interpretation(s) consistent with the written description in applicants' specification as it would be interpreted by one of ordinary skill in the art. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Donaldson Co., Inc.*, 16 F.3d 1190, 1192-95, 29 USPQ2d 1845, 1848-50 (Fed. Cir. 1994). See MPEP 2111. Specifically, with regard to magnetic recording media, "biasing" is known to refer to the application of a magnetic field or coupling force onto a layer to effect the magnetic properties and orientation of the layer. With regard to soft magnetic layers, applicants' have disclosed three common methods of "biasing" the soft magnetic layers, but have not explicitly defined these methods as biasing, nor explicitly stated that these are the only known means of biasing (*specification Paragraph 0006*). As such, in terms of the structure imparted to the claimed magnetic

Art Unit: 1773

recording *medium*, the Examiner notes that “non-biasing” is being interpreted to exclude antiferromagnetic or hard magnetic layers which are deposited adjacent to the soft magnetic layer opposite the side of the soft magnetic layer facing the recording layer.

4. Regarding the limitation(s) “without any means of biasing” in claim 14, the Examiner has given the term(s) the broadest reasonable interpretation(s) consistent with the written description in applicants’ specification as it would be interpreted by one of ordinary skill in the art. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Donaldson Co., Inc.*, 16 F.3d 1190, 1192-95, 29 USPQ2d 1845, 1848-50 (Fed. Cir. 1994). See MPEP 2111. Specifically, “biasing” is interpreted as defined above and the “means of biasing” has been interpreted with regard to the claimed *product* and is deemed to only encompass antiferromagnetic or hard magnetic layers which are deposited adjacent to the soft magnetic layer opposite the side of the soft magnetic layer facing the recording layer. Since biasing applied by an external magnetic field is an *apparatus limitation* and biasing applied during the formation of the recording medium is a *method limitation*, applicants’ claimed *product* is not excluded from being biased via an external magnetic field or by biasing applied during formation of the recording medium.

Specification

5. The disclosure is objected to because of the following informalities: Paragraph 6 contains the typographical error “antiferroamgnetic” in section (3). Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 1 – 10, 12 – 21, 25, 32 – 34 and 36 – 47 are rejected under 35

U.S.C. 112, first paragraph, as failing to comply with the written description requirement.

The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1 and 34 recite the limitation “non-biased” and claim 14 recites the limitation “without any means for biasing”. While “biasing” is an art recognized term, the Examiner notes that there are many known methods of applying biasing to a soft magnetic layer and applicants’ have not positively recited in their as-filed disclosure any support for forming a “non-biased” soft magnetic layer or a soft magnetic layer “without any means for biasing”, in fact, applicants do not even use the term “biased” or “biasing” in their as-filed disclosure. The Examiner notes that applicants do have support for a “radial single domain state [that] is generated via an internal anisotropy mechanism, rather than relying upon interfaces” (*Paragraph 0008 of specification*).

Art Unit: 1773

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 25 and 33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 25 recites the further step of depositing a second non-magnetic spacer material between the soft magnetic underlayer and the perpendicular magnetic layer, yet base claim 14 requires that the soft magnetic layer and the perpendicular magnetic layer be directly deposited on each other. Since the limitation "directly" is known in the art to explicitly exclude additional layers being present between the claimed elements, the addition of the second non-magnetic spacer layer is not permitted by the language of base claim 14. Applicants are suggested to rewrite claim 25 as an independent claim clarifying that the second non-magnetic spacer layer is directly deposited on the soft magnetic layer and the perpendicular magnetic layer is directly deposited on the second non-magnetic spacer layer. For purposes of evaluating the prior art, the Examiner has applied the preceding interpretation to this claim.

Claim 33 is dependent on claim 30, which has been cancelled. For purposes of evaluating the prior art, the Examiner has interpreted this claim to depend from claim 32.

Claim Rejections - 35 USC § 103

10. Claims 14, 25, 34, 36, 37, 40, 42 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. (U.S. Patent No. 4,687,712) in view of Mallary et al. (U.S. Patent No. 5,226,966) and applicants' admissions.

Regarding claim 14, Sugita et al. disclose a perpendicular magnetic recording medium comprising a substrate (*Figure 10, element 12*), a non-magnetic spacer layer directly on the substrate (*element 17*), a soft magnetic underlayer directly on the non-magnetic spacer material (*element 13*), and a perpendicular magnetic layer directly on the soft magnetic underlayer (*element 2*).

Sugita et al. fail to disclose the medium being in the shape of a disk (claims 34 and 36), nor whether said soft magnetic underlayer acts as a single magnetic domain without any means for biasing.

However, Mallary et al. disclose magnetic disks capable of storing large quantities of information (*col. 1, lines 22 – 27*) wherein the soft magnetic layer used under a vertical (i.e. "perpendicular") magnetic recording medium is oriented in one direction and exhibits "uniaxial anisotropy" (*col. 2, lines 40 – 65*) without any means for biasing in order to obtain improved signal strength (*see Paragraph 4 above and, Mallary et al. - col. 3, lines 41 – 57 and col. 4, lines 1 – 9*). The Examiner notes that "uniaxial anisotropy", or the orientation of the magnetic material such that the magnetic field is oriented in one direction (*col. 2, lines 44 – 47*) is equivalent to stating that the soft magnetic layer is a single magnetic domain, as illustrated by applicants' admissions disclosing that removing spike-noise in a soft magnetic layer is accomplished by forming

the soft magnetic layer into a single domain state, where the spike noise is due to "local dispersions of the anisotropy axes in the soft magnetic material" (*Paragraph 0005*).

Hence, if all the domains are pointed in the same direction, the anisotropy is uniform through-out the layer and the layer is said to exhibit "uniaxial anisotropy", or the orientation all in one direction.

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Sugita et al. to use a magnetic disk wherein the soft magnetic layer acts as a single magnetic domain without any means for biasing as taught by Mallary et al., since such a structure results in a medium capable of storing a large quantity of information while maintaining good signal strength.

Regarding claim 36, Mallary et al. teach that the magnetic easy axis lies in the radial direction, i.e. in a plane parallel to the surface of the substrate (*col. 3, lines 45 – 48*).

Regarding claims 25 and 42, Sugita et al. disclose second non-magnetic spacer layers meeting applicants' claimed structural limitations (*Figure 9, layer 16*).

Regarding claims 37 and 40, Sugita et al. disclose multilayered soft magnetic underlayers meeting applicants' claimed structural limitations (*Figure 10, layers 14 and 15*).

Regarding claim 43, Mallary et al. disclose that the hard axis is in the circumferential direction, i.e. perpendicular to the radial direction (*col. 4, lines 4 – 6*).

11. Claims 19, 20 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. in view of Mallary et al. as applied above, and further in view of Howard et al. (U.S. Patent No. 4,632,883).

Sugita et al. and Mallary et al. are relied upon as described above.

Regarding claims 19 and 41, neither of the above teach using Ta non-magnetic spacer layers.

However, the Examiner deems that Ti and Ta are known equivalents in the field of non-magnetic spacer materials used above and below soft magnetic layers, as taught by Howard et al. (*col. 1, lines 41 – 44; col. 2, lines 6 – 12; and col. 3, line 63 bridging col. 4, line 10*).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, Ti and Ta are equivalents in the field of non-magnetic spacer layer materials, wherein Ta is a preferred embodiment since it further results in improved perpendicular coercivity of the perpendicular magnetic layer (*col. 2, line 61 bridging col. 3, line 2*).

Regarding claim 20, Sugita et al. teach non-magnetic spacer layers and soft magnetic layers meeting applicants' claimed thickness limitations (*Figures 4 and 5; col. 2, lines 29 – 64; col. 3, lines 1 – 35; col. 4, lines 36 – 41; and Examples*).

12. Claim 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. in view of Mallary et al. as applied above, and further in view of Jin et al. (U.S. Patent No. 5,998,048).

Sugita et al. and Mallary et al. are relied upon as described above.

Neither of the above disclose "the saturation field in the direction of said hard axis of said soft magnetic underlayer is greater than or equal to about 40 Oe".

However, Jin et al. teach that large anisotropy fields are desired in soft magnetic materials in order "to raise the FMR frequency so that ferromagnetic resonance does not interfere with the high-frequency operation of the magnetic materials" (*col. 1, line 66 bridging col. 2, line 58*), wherein the anisotropy field can be raised to meet applicants' claimed limitations (*col. 3, lines 2 – 3 and col. 7, lines 3 – 6*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Sugita et al. in view of Mallary et al. to use a soft magnetic underlayer meeting applicants' claimed property limitations as taught by Jin et al. since such a soft magnetic material will insure that ferromagnetic resonance does not interfere with the performance of the magnetic medium.

13. Claims 1 – 3, 9, 10, 32, 33, 38 and 45 - 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. in view of Mallary et al. as applied above, and further in view of Ikeda et al. (U.S. Patent No. 6,468,670 B1).

Sugita et al. and Mallary et al. are relied upon as described above.

Regarding claims 1, 9, 10, 32 and 38, neither of the above disclose using a CoFeB based soft magnetic underlayer.

However, the Examiner deems that NiFe and CoFeB are known equivalents in the field of soft magnetic layers for perpendicular media, as taught by Ikeda et al. (*col. 3, lines 25 – 48*).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, NiFe and CoFeB are equivalents in the field of soft magnetic material used in forming soft magnetic layers for perpendicular recording media. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

Regarding claims 2, 3, 33 and 45 - 47, Sugita et al. teach non-magnetic spacer layers and soft magnetic layers meeting applicants' claimed thickness limitations (*Figures 4 and 5; col. 2, lines 29 – 64; col. 3, lines 1 – 35; col. 4, lines 36 – 41; and Examples*).

14. Claims 4 – 6, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. in view of Mallary et al. and Ikeda et al. as applied above, and further in view of Howard et al. ('883).

Sugita et al., Mallary et al. and Ikeda et al. are relied upon as described above.

Regarding claims 4 and 13, none of the above teach using Ta non-magnetic spacer layers.

However, the Examiner deems that Ti and Ta are known equivalents in the field of non-magnetic spacer materials used above and below soft magnetic layers, as taught by Howard et al. (*col. 1, lines 41 – 44; col. 2, lines 6 – 12; and col. 3, line 63 bridging col. 4, line 10*).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, Ti and Ta are equivalents in the field of non-magnetic spacer layer materials, wherein Ta is a preferred embodiment since it further results in improved perpendicular coercivity of the perpendicular magnetic layer (*col. 2, line 61 bridging col. 3, line 2*).

Regarding claims 5, 6 and 12, Sugita et al. teach non-magnetic spacer layers and soft magnetic layers meeting applicants' claimed thickness limitations (*Figures 4 and 5; col. 2, lines 29 – 64; col. 3, lines 1 – 35; col. 4, lines 36 – 41; and Examples*).

15. Claims 7, 8, 15 – 18, 21 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. in view of Mallary et al. and Ikeda et al. as applied above, and further in view of Fujimura et al. (U.S. Patent No. 5,466,308) and Kraus et al. (IEEE Trans. Mag., 30(2), 1994, 530 - 532).

Sugita et al., Mallary et al. and Ikeda et al. are relied upon as described above.

None of the above teach the exact iron-cobalt-boron alloy percents claimed by applicant.

Art Unit: 1773

However, Kraus et al. teach the effect of varying the Fe and Co percentages on the soft magnetic properties of a CoFeB alloy (*Experimental and Figures*) and Fujimura et al. teach the effect of changing the B content in CoFeB alloys (*Figure 2*).

Therefore, the Examiner deems that it would have been obvious to one having ordinary skill in the art to determine an amount of Co, Fe and B meeting applicants' claimed atomic percents by optimizing the results effective variable through routine experimentation. *In re Boesch*, 205 USPQ 215 (CCPA 1980); *In re Geisler*, 116 F. 3d 1465, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997); *In re Aller*, 220 F.2d, 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Response to Arguments

16. The prior Double Patenting in view of Litvinov et al.

17. The 35 U.S.C. § 102(e)/(f) and/or 103(a) rejections in view of Litvinov et al.

The above noted rejection has been withdrawn because applicant(s) amendment(s) have set forth new limitations (e.g. "non-biased" and "without any means of biasing") no longer anticipated, nor rendered obvious, by the above noted rejection.

18. The rejections under 35 U.S.C § 103(a) – Sugita et al. in view of Mallery et al., either alone or in view of various references

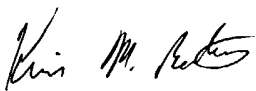
Applicant(s) arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on (571) 272-1516. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Kevin M. Bernatz, PhD
Primary Examiner

July 9, 2004